hydroxide. The inventors have discovered that substantially all of the thiocyanate and other anions deposited can be removed from Type II resin by treatment with alkali metal hydroxide after an irretrievable loss of about 50% of the virgin capacity of the resin. As set forth at page 5 of the application, penultimate full paragraph, the invention "enables recovery of over 50% of the virgin capacity of the resin with each cycle." Thus, the invention enables substantially complete removal of thiocyanate by action of alkali metal hydroxide. Such substantially complete removal had not been obtained by the prior art.

The resin can be exhausted with heat stable salt anions, including thiocyanate, but need not be exhausted. In claims 1-8, the invention is claimed as a process for regenerating a Type II strong base anion exchange resin wherein the resin is contacted with alkali metal hydroxide under conditions sufficient "to obtain recovery of over 50% of the virgin capacity" of the resin.

As set forth in claims 9-12, the invention is claimed as a cyclic process for purifying an aqueous alkanolamine solution containing heat stable salts, heat stable salt anions, or both, by contacting the solution with Type II strong base anion exchange resin to transfer at least some heat stable salt anions from the solution to the resin. Thereafter, the resin is regenerated to remove from the resin substantially all of the heat stable salt anions thus transferred by action of alkali metal hydroxide.

The Office Action

The Examiner has requested documents and materials material to the patentability of the application from the litigation in which the patent sought to be re-issued was involved.

The application has been objected to for failure of the assignee to establish ownership interest under 37 C.F.R. § 3.73, and the assignee has not satisfied the requirement under 37 C.F.R. § 1.178 to offer to surrender the original patent.

Claims 1-12 are pending in the application.

Claims 1-8 have been found allowable.

Claims 9-12 stand rejected under 35 U.S.C. § 251 as being based on new matter added to the patent for which re-issue is sought. Original support for the phrase in claims 9 and 12 that the "alkali metal hydroxide removes from resin *substantially all* heat stable salt anions transferred to the resin in step a)" is said not to be found in the patent. Original support for the use in claim 11 of the value "approximately 40% by weight alkanolamine" is said not to be found in the patent.

Claims 9-12 stand rejected under 35 U.S.C. § 112, paragraph one, for failure to adequately describe the claimed invention in view of the alleged lack of support for the phrases identified in the previous paragraph.

Claims 9-12 stand rejected under 35 U.S.C. § 251 for improperly recapturing subject matter deliberately cancelled during prosecution of the original patent. The Examiner has compared the recitations "to transfer at least some heat stable salt anions from the solution to the resin" and "removes from the resin *substantially all* heat stable salt anions transferred to the resin in step a)" in claims 9 and 12 with the recitations of claim 5 that "the active anion exchange sites of said Type II strong base anion exchange resin *are loaded* with heat stable anions" and "to obtain recovery of over 50% of the virgin capacity of the loaded Type II resin," respectively.

Claims 9-12 stand rejected under 35 U.S.C. § 102 (b) as anticipated by, or under 35 U.S.C. § 103 as unpatentable, in view of Keller, U.S. 5,045,291.

Response

Documents from litigation

On September 12, 2001, Applicant submitted a copy of the final judgment of the United States District Court for the Northern District of Texas, in which Court the patent for which re-issue is sought herein had been involved in litigation. As can be seen from that document, the matter was settled by mutual agreement of the parties. Thus, the patent no longer is involved in litigation. On September 19, 2001, the Examiner acknowledged receipt of the judgment.

The sole document material to the patentability of this re-issue application is an order of the United States District Court for the Northern District of Texas. As part of that litigation, the court issued an order construing selected terms of the claims (a "Markman" order). A copy of that order is provided herewith.

As can be seen, the Court, *inter alia*, construed 4 claim phrases, as set forth in the following table:

Phrase	Construction
Heat stable salt; heat stable salt anions	"Any heat stable salt or heat stables [sic] salt anion, or combination of heat stable salts or heat stable salt anions, that may or may not include thiocyanate."
Virgin capacity	"The initial hydroxide loading of the anion exchange resin, in the process in which the resin is to be used, prior to exposure of the resin to thiocyanate."
Until the active anion exchange sites ... are loaded with heat stable salts	"All or substantially all of the anion exchange sites are loaded with heat stable salt anions; i.e., the resin is loaded to exhaustion prior to regeneration."
[A] process ... comprising ... contacting said loaded Type II resin with an amount of an alkali metal hydroxide ... to obtain recovery of over 50% of the virgin capacity of said loaded Type II resin	"At least 50% of the virgin capacity must first have been lost prior to regeneration. Thus, an exchange site must first be loaded before it can be recovered. Further, the claim language allows for the use of other chemicals so long as the contact with the alkali metal hydroxide causes at least 50% of the active exchange sites on the resin to exchange their heat stable salt anions for hydroxide anions."

Order at pages 22-23.

Applicants do not agree with these constructions and submit that, except for 'virgin capacity,' these constructions are contrary to law. For example, Applicants respectfully submit that "heat stable salt" or "heat stable salt anions" must include thiocyanate, for the invention is directed to removal of thiocyanate. That heat stable salt includes thiocyanate is clearly established throughout the specification and prosecution history. Thus, Applicants respectfully submit that the court's construction is contrary to well-establish law that requires that intrinsic evidence be used to construe a claim. This and other arguments apply to other constructions as well.

However, the litigation was settled upon an agreement of the parties. Therefore, no appeal has been or will be taken in this litigation.

Submission of Formal Papers

Applicants submit herewith properly completed and then executed submission establishing ownership of the patent for which reissue is sought and satisfying the requirements of 37 C.F.R. § 3.73 and offer to surrender U.S. Pat. No. 5,788,864, for which reissue is sought by this application.

Claims 9-12 Are Not Based On New Matter

Applicants respectfully traverse the rejection of claims 9-12 under 35 U.S.C. § 251 as being based on the matter added to the application. Applicants respectfully submit that the material identified as having been added is found, clearly and unambiguously, in the specification of the patent.

1. "Substantially all"

The removal from the resin of a "substantially all heat stable salt anions transferred" to the resin from the solution by alkali metal hydroxide is disclosed in Example 1. As described in

the first full paragraph on page 6, the resin was subjected to exhaustion (saturation) with thiocyanate in each cycle. As seen in Table I at page 6 of the application, the resulting capacity for each of cycles 1 through 4 after regeneration with sodium hydroxide is substantially equal, between about 0.55 and 0.61 meq/ml. Thus, substantially all of the heat stable salt anion transferred to the resin from the solution was removed by regeneration with sodium hydroxide in each of these cycles. Therefore, Applicants respectfully submit that the phrase "alkali metal hydroxide removes from the resin substantially all heat stable salt anion transferred to the resin in step (a)" is found in the patent for which re-issue is sought.

2. "Approximately 40% by weight"

Support for the "approximately 40% by weight alkanolamine" language also is found in the patent, albeit not *in haec verba*. Rather, a calculation using information found in the Examples 2-6 yields support for the phrase.

The exhaustion solution used in each of these examples is 0.33 meq KSCN per gram 50% MDEA/water solution. The molecular weight of KSCN is 97.1. Because KSCN ionizes to K^+ and SCN^-, it yields one equivalent per mole. Thus, a 0.33 meq KSCN weighs 0.032 g ($0.33*10^{-3}$ eq x 97.1 g/eq = 0.032 g). According to the Examples, this quantity of KSCN is found in 1 g of 50% MDEA/water solution. As is typical for liquids, the proportions of the solution are expressed by volume. The density of water is 1 g/ml; the density of MDEA is 0.703 g/ml. Thus, an equivolume mixture of MDEA and water comprises, by weight, 41.3% MDEA and 58.7% water. Thus, 0.33 meq KSCN per gram 50% MDEA/water solution comprises 0.032 g KSCN, 0.413 g MDEA, and 0.587 g water, or approximately 40% by weight alkanolamine.

The Invention Is Described In The Specification

Applicants respectfully submit that the rejection of the claims under 35 U.S.C. § 112, paragraph one, is traversed by the arguments set forth above. Inasmuch as the phrases in question are described in the patent, as set forth herein above, this rejection cannot stand.

Claims 9-12 Do Not Improperly Recapture
Subject Matter Deliberately Cancelled During Prosecution

Applicants respectfully traverse the rejection of claims 9-12 under 35 U.S.C. § 251 for improperly recapturing subject matter deliberately cancelled during prosecution of the original patent. Applicants respectfully submit the claims 9-12 have not recaptured subject matter cancelled to obtain issue of the original patent claims 1-8. Rather, claims 9-12 express the method of the invention in a different manner than again-allowed patent claims 1-8.

Whereas claims 1-8 characterize the method of the invention in a manner that focuses on the recovery of 50% of virgin capacity after regeneration, claims 9-12 characterize the invention as it relates to removal of substantially all of the heat stable salt anions that were deposited during a transfer step. This manner of claiming merely expresses the method of the invention and the improvement achieved thereby, without regard to whether the resin is exhausted with heat stable salt anions during the transfer step. Indeed, claims 9-12 do not require exhaustion. All pending claims (1-12) reflect the subject matter applicants regard as the invention.

1. "Transfer At Least Some" Is Not Related To The Degree of Resin Loading

Applicants respectfully submit that the Examiner's comparison at page 5 of the Office Action of the characterization of the fraction of heat stable salt anion transferred from the solution in claims 9-12 with the characterization that "the resin is loaded" is a comparison of proverbial apples and oranges. The fraction of heat stable salt anion removed from the solution,

i.e., whether only some or all of the heat stable salt anion is removed, has nothing to do with the fraction of resin capacity that becomes loaded. For example, consider a quantity of alkanolamine solution containing 10 equivalents of heat stable salt anion and two resin beds, one having a capacity of five equivalents, the second having a capacity of 50 equivalents. The first bed would be exhausted when only one half of the heat stable salt anion was transferred from the solution, whereas the second bed would be loaded to only 20% of capacity when all of the heat stable salt anion is transferred from the solution. Therefore, Applicants respectfully submit that this comparison is fundamentally flawed, as one has nothing to do with the other.

2. Resin "Normally" Is Loaded To Exhaustion

Further, with regard to the portion of resin that becomes loaded with heat stable salt anion, the Examiner's citation of Amendment E (Paper No. 14) of the original prosecution, to the effect that "the claimed invention provides that all available active sites are normally loaded" is important for more than one reason. The first reason is that it points out that the resin *normally* is fully loaded, or *exhausted*, i.e., that *all* active sites on the resin are caused to have heat stable salt anion associated with them. Such exhaustive loading is described as normal because loading to exhaustion uses all the resin in the resin bed before regeneration and is a typical mode of operation. However, the "normal" nature of loading to exhaustion includes the recognition that there is another mode of operation, *viz.*, one in which the resin need not be fully loaded or exhausted.

In the specification, the word "load" is used as a verb, not as an adjective. See page 2, last paragraph ("the second step loads hydroxide ions on the resin."). Thus, "loaded" means to have associated anions with an ion exchange resin. Such usage is consistent with the cited portion of the prosecution history. The word "exhaustion" is used to indicate the normal usage

of resin, i.e., the resin normally is fully loaded. "Exhaustion" appears in this usage at page 6, first full paragraph and second paragraph of Example 2; page 7, line 3, second paragraph of Example 3, and second paragraph of Example 4; and page 8, second paragraph of Example 6.

Thus, the cited argument set forth during prosecution of the original application was directed to a situation considered normal or typical by Applicants, i.e., the circumstance in which all active sites are loaded. Normally, a user likely would want to 'make the most' of a resin bed by fully loading the resin, rather than using only a fraction of the resin. The inventors discovered that the maximum recovery available when thiocyanate is present in the heat stable salt anion is about 50% of the virgin capacity. The other about 50% of the capacity is irretrievably lost. Thus, for each exhaustion cycle, about 50 percent of the virgin capacity was recovered. After the first exhaustion and regeneration, the quantity of heat stable salt anion deposited on the resin during the exhaustion cycle was equal to the quantity removed from the resin in the subsequent regeneration cycle. Put another way, the quantity transferred to the resin substantially equaled the quantity removed during the subsequent regeneration.

Thus, when the resin is loaded to exhaustion, all the heat stable salt anion loaded is removed by regeneration after the first cycle, and 50% of the virgin capacity is recovered. When the resin is not loaded to exhaustion, all of the heat stable salt anion deposited on the resin is removed by regeneration after the resin capacity has been reduced by the irretrievable loss.

The irretrievable loss of capacity to thiocyanate need not occur in a single step. As set forth in the prosecution history, loading to exhaustion is 'normal.' Thus, as recognized by the inventors, and as would be recognized by skilled practitioners, it is possible to operate such a system by not exhausting the resin before regeneration. In that circumstance, i.e., if the resin is not exhausted, it may take plural transfer/regeneration cycles before the 50% of the virgin

capacity is irretrievably lost. Thereafter, substantially all of the thiocyanate transferred to the resin is removed by action of alkali metal hydroxide during subsequent regeneration.

3. Seal '602 and Applicants' Prior Arguments Relating Thereto Support Claims 9-12

The two quotations cited at page 6 of the Office Action relating to Seal, U.S. Pat. No. 4,469,602, from the prosecution history of the original application serve only to support Applicants' argument here. In particular, "Seal has nothing to do with the claimed invention."

Seal '602 is directed to a method for controlling whether to regenerate the anion exchange resin bed of a water softener. The object of the invention is to schedule regenerations periodically at a convenient time of day while ensuring sufficient softening capacity between regenerations. In accordance with the method, the remaining capacity of the resin bed is compared with the fluid quantity expected to be treated during the next day with the object of scheduling regeneration only when necessary.

The method involves assessing whether the bed is depleted to a predetermined percentage of the "total resin bed treating capacity" that resulted from the previous regeneration. The "typical" predetermined percentage is 50%, but the predetermined percentage could be set at any value. In accordance with the method, a sensor placed in the resin bed is used to determine when the bed has been depleted to the predetermined percentage. The quantity of fluid treated in a given period (typically a day) between regenerations is measured and the data sent to a microprocessor. The total quantity treated since the last regeneration and the average fluid quantity treated per day also are calculated. When this sensor signals to the microcomputer that the bed has been depleted to the predetermined capacity, the microcomputer calculates both the total resin bed treating capacity resulting from the previous regeneration and the remaining treatment capacity of the bed. The microcomputer compares the remaining bed capacity with the

quantity of fluid predicted for treatment during the next day. If the quantity predicted for treatment exceeds the remaining bed capacity, a regeneration cycle is initiated. However, if the quantity predicted for treatment can be accommodated within the remaining bed capacity, no regeneration cycle is initiated. Rather, treatment continues for another day, at which time the need for a regeneration cycle is re-assessed.

Thus, there are many significant differences between the teachings of Seal '602 and the claimed invention. The Examiner has identified one such difference — Seal '602 does not relate to heat stable salt anions or to thiocyanate. The Examiner cited Seal '602 "for the teaching of the step of loading the resin with anions such that one half (50%) of the exchange sites remain active." Office Action, page 6. However, not only is this not what Seal '602 taught, but also Seal '602 has absolutely nothing to do with the claimed invention.

Seal '602 teaches a method of operating a resin bed in a manner that ensures that the bed will be able to accommodate ion exchange expected to be required before the next scheduled regeneration. Use of "50%" of that capacity for the "test point" is merely exemplary. Seal '602 could have used any value, such as 30% or 70%, for the example. The percentage value used was purely an arbitrary selection. Also, the denominator of this percentage calculation in Seal '602 is the capacity resulting from the previous regeneration, whereas the denominator of the calculation in the application is virgin capacity. Further, Seal '602 was dealing with a completely reversible exchange, in contrast to the exchange system of the claimed invention. Thus, recovery of more than 50% was not new to the process of Seal '602.

In the paragraph bridging pages 6 and 7 of the Office Action, the Examiner has cited phrases added to the claims in separate amendments. The first claim amendment cited is 'to obtain regeneration of over 50 % of the virgin capacity of the loaded Type II resin;' it was said to

reflect the arguments regarding, *inter alia*, Seal '602. Regarding the second, the Examiner stated that 'loaded' was 'newly recited' in new claims.

A. "Recovery of over 50%"

The amendment in which the "recovery of over 50%" language was added cannot be considered in a vacuum. Rather, it must be considered together with the other language in the claim that was simultaneously deleted, *viz.*, "to alter said Type II strong base resin such that at least one half of the original anion exchange sites remain active." (Amendment October 1, 1997) Applicants argued at that time in response to a rejection under 35 U.S.C. § 121, paragraph one, as follows:

> The Examiner has objected to the phrase "such that about one half of the original exchange sites remain active" as being new matter and refers to the Specification at page 10 as disclosing that over 50% of the virgin capacity is recovered. It is submitted that the issue here is one of semantics; however, to further prosecution the Applicants have amended each of the independent claims to utilize the language set out on page 10 of the Specification.

Applicants respectfully submit that presence in the claims of the element "to obtain recovery of over 50 percent of the virgin capacity" is but one way of expressing an advantage of the claimed invention. The element was not added to distinguish over Seal '602, as it was not necessary so to do. It was so expressed in the claims as filed ("as much as 50% or more of the virgin capacity of the resin is converted to the OH^- form." Claim 1 as filed). The inventors discovered that it is possible, in accordance with the practice of the claimed invention, to obtain recovery of 50% of the virgin capacity. The language that "about one half of the original exchange sites remain active" reflects the irretrievable activity loss incurred when resin is contacted with thiocyanate, as does the present language of claims 1-8. Thus, claims 1-8 were allowed, which allowance has been confirmed in this application.

B. "Loaded"

The context in which the word 'loaded' was added to the claims was in new claims 22, 26, and 29, as follows:

> whereby said Type II strong base anion exchange resin is loaded with said heat stable salt anions to alter said Type II strong base resin such that about one half of the original anion exchange sites remain active.

As Applicants argued with regard to rejection of these claims under 35 U.S.C. § 112, paragraph one, the 50% value related to the degree of regeneration afforded by the invention when the resin was exhausted, i.e., after loading to the approximate totality of the virgin capacity, and reflected what activity was left after about 50% of the virgin capacity activity was irretrievably lost. The "loaded . . . to alter . . . original exchange sites" language reflects the irretrievable loss, and was neither necessary to distinguish nor entered to distinguish over Seal '602.

4. There Is No Recapture

As set forth during the original prosecution, "Normally, the resin is loaded to approximate totality of its exchange capacity before regeneration, whatever that capacity is. Subsequent exhaustion and regeneration cycles do approximate complete exchanges of the active nominal 50% of virgin capacity. The other 50% of virgin capacity seems to be irretrievably lost following the initial exposure to SCN." (Amendment dated October 1, 1997, page 4) There are many points concerning this text that must be appreciated, as follows:

1. Resin **normally** is loaded to exhaustion. Thus, whereas loading to exhaustion may be typical, the application recognizes that loading to a lesser level is possible.

2. When the bed is exhausted with thiocyanate, the bed can be regenerated to only about 50% of the virgin capacity, as illustrated in the Examples.

3. After the first bed exhaustion, substantially all of the thiocyanate loaded onto the bed is removed by the subsequent regeneration. Only by substantially complete removal of this subsequently-loaded quantity can a bed capacity of 50% of the virgin capacity be restored.

4. About 50% of the virgin capacity of the resin is lost when resin is used to absorb thiocyanate. After this portion of the bed activity is lost to thiocyanate, no additional capacity is lost in this way.

The prior art did not recognize that thiocyanate and other heat stable salt anions could be substantially completely removed from Type II resin by regeneration with alkali metal hydroxide. The inventors recognized that, when thiocyanate is present, about 50% of the virgin capacity is irretrievably lost. The inventors also recognized that, after this loss, substantially all of the heat stable salt anions, including thiocyanate, can be removed from the resin. The inventors noted that, normally, resin is loaded to exhaustion. However, a skilled practitioner would recognize that this fairly suggests that exhaustion need not occur with every transfer step.

Applicants respectfully submit that "recovery of over 50% of virgin capacity" is but one manner of expressing the concept of the invention, i.e., that one can recover over 50% of the virgin capacity when regenerating after exhaustion by removing as much heat stable salt anion, including thiocyanate, as is loaded. "Regenerating repeatedly without substantial further reduction in active anion exchange sites" is another manner.

Applicants respectfully submit that the points raised on page 8 of the Office Action highlight that, even if claims 9-12 are found to have recaptured subject matter given up during prosecution, the claims are materially narrower in another aspect. *Hester Industries Inc. v. Stein Inc.*, 46 U.S.P.Q.2d 1641, 1649-50 (Fed. Cir. 1998).

A. Applicants' Argument Regarding Seal '602

Applicants respectfully submit that clarification of Applicants' argument regarding Seal '602 is appropriate. In the response filed October 1, 1997, Applicants noted simply that the "50%" value in Seal '602 related to the extent of loading of the bed, whereas the "50%" in the application related to the available extent of regeneration in accordance with the invention.

Thus, Applicants' argument related to the point that Seal '602 is directed to determination of whether a regeneration should be carried out when an arbitrary extent of exhaustion is reached. "Clearly, Seal '602 has nothing to do with the claimed invention." (Amendment of October 1, 1997, page 4).

When first Seal '602 was cited, Applicants tried to clarify that, whatever Seal '602 teaches, it does not teach loading resin with anions such that an arbitrarily-selected 50% (it could have been 30%, 70%, or any number) of the exchange sites remain active. In Seal '602, all of the sites remain active because it is a completely reversible system. Rather, Seal '602 teaches the predictive method set forth above.

B. Claims 9-12 Are Materially Narrower than Claims 1-8

The Examiner has argued that the fact that 50% of the resin activity is lost compels a finding that claims 9-12 are broader than the original recitation "to obtain recovery of over 50% of the virgin capacity of the loaded Type II resin." Applicants respectfully submit that claims 9-12 are materially narrower.

The Examiner states at page 8 of the Office Action that substantially all of the heat stable salt anions are not removed after the first exposure. Applicants concur with this statement, and note that substantially complete removal is not achieved until the approximately 50% of the virgin capacity is lost. However, whereas the Examiner cites this as evidence that claims 9-12

impermissibly recapture subject matter, Applicants respectfully submit that this is evidence relating to a material narrowing of claims 9-12.

Claims 1-8 encompass within their scope each and every cycle of the Examples. They encompass the first cycle because about 50% of the virgin capacity is achieved by regeneration, and they encompass each cycle thereafter for the same reason. The first regeneration cycle of each of the Examples clearly does not remove substantially all of the heat stable salt anions, but does achieve 50% of virgin capacity.

Claims 9-12 require removal from the resin during regeneration of substantially all heat stable salt anions transferred to the resin from the alkanolamine solution. As set forth above, removal of substantially all of heat stable salt anion deposited is not contradictory to or precluded by the fact that about 50% of the virgin capacity is irretrievably lost. Rather, as illustrated by each cycle after the first cycle in the examples, the claimed process removes substantially all thiocyanate deposited on the resin.

These rejected claims 9-12 do not encompass within their scope any cycles until the approximately 50% of the activity is irretrievably lost. Claims 9-12 do not cover transfer/regeneration cycles until the 50% irretrievable loss has occurred, and they do not encompass at least the first transfer/regeneration cycle. The claims thus are narrower in this important aspect.

Applicants' amendment of the claims to recite "to obtain recovery of over 50 percent of the virgin capacity" is cited as evidence of the surrender of claim scope that Applicants now allegedly attempted to recapture. However, the alleged surrender was not a surrender at all but rather a simple a re-wording. (Indeed, the concept of 50% recovery of virgin OH^- functionality was in the original claims as filed.) Applicants respectfully submit that no re-capture is achieved

by the rejected claims. Rather, these claims merely express the claimed invention in a different way.

Applicants respectfully submit that the paragraph on page 8 of the Office Action confuses many concepts and sets forth unfounded assertions. In particular, there is no inconsistency between the language of the rejected claims requiring removal from the resin of substantially all heat stable salt anions transferred to the resin in that the deposition step and the statement that "50% of the virgin capacity seems to be irretrievably lost." As set forth above, claims 9-12 do not encompass within their scope the first cycle, i.e., the first heat stable salt anion absorption cycle and subsequent regeneration, because substantially all of the anions transferred cannot be removed (activity is irretrievably lost). It is true that not all of the heat stable salt anion transferred in the first transfer cycle will be removed in the first regeneration cycle. Indeed, if the resin is not loaded to exhaustion in the first transfer cycle, it is likely that not all the heat stable salt anion deposited in that the second transfer cycle will be removed by the second regeneration cycle. However, the rejected claims are not intended to apply to every cycle. Rather, they are intended to apply to the steady state condition that none of the prior art technology recognized, specifically that after a sufficient quantity of thiocyanate is processed in a Type II strong base anion exchange resin bed, about one-half of the virgin capacity is lost, but the other half can be repeatedly regenerated substantially without additional loss of capacity. This is one aspect of the invention described in the specification.

The Examiner has noted that the rejected claims, directed to removing substantially all of whatever anion is deposited, are different from "loading" the resin and "obtaining recovery of over 50% of the virgin capacity of the resin." Applicants do not assert to the contrary. The rejected claims do not require loading to exhaustion. However, Applicants do assert that there is

no improper recapture of subject matter cancelled in the original prosecution. Rather, Applicants respectfully submit that the rejected claims are merely another way of claiming Applicants' invention, and that Applicants are entitled to make these claims as set forth above, without violating the rule against recapture. The rejected claims merely cover Applicants' invention in a different manner. Whereas the original (and again allowed) claims, and indeed the claims as originally filed, encompass every exemplified cycle of operation, the rejected claims do not. The new claims merely express the subject matter Applicants' regard as the invention in a different manner, and with the result of having materially narrower scope.

Each of the Examples illustrates the invention of the now-rejected claims, as each clearly shows that substantially all of the thiocyanate absorbed during an absorption cycle is removed during the subsequent regeneration cycle for each cycle after the first.

Further, Applicants respectfully submit that the claims are narrower in an aspect relating to the "loading ... recovery" recitation invoked by the Examiner. The scope of the rejected claims does not result in recapture of subject matter said to have been surrendered. The rejected claims do not cover the first cycles of any operation, until the 'about 50 %' is irretrievably lost. As stated in the specification, "... about 50% of the virgin capacity can be repeatedly recovered with NaOH regeneration after exchange with thiocyanate ... about 50% of the virgin capacity is not recoverable by this method."

Whether the invention is viewed as a cyclic process for purifying an aqueous solution or as a process for regenerating Type II resin, it is directed to the discovery that thiocyanate can be efficiently, effectively, repeatedly, and substantially completely removed from Type II strong base anion exchange resin after a first cycle or series of cycles during which about 50% of the virgin capacity is irretrievably lost. As set forth during the original prosecution, a resin normally

is loaded to full capacity, i.e., to exhaustion. However, as skilled practitioners recognize, a resin need not be loaded to exhaustion. Rather, resin may be loaded to only a fraction of capacity during a loading cycle. Under such conditions, regenerations will remove all of the thiocyanate absorbed by the resin after about one-half of the resin activity is irretrievably lost. However, and thereafter, in each regeneration cycle, it is possible, in accordance with the method of the invention, to remove substantially all thiocyanate and other heat stable salt anions deposited during the previous deposition cycle. Such complete regeneration can be achieved in accordance with the invention without regard to whether the resin is exhausted before regeneration.

When the resin is exhausted on each cycle, it is possible to express the invention as a method by which at least about 50% of the virgin capacity of the resin is recovered after regeneration. However, when the resin is not repeatedly fully loaded, it is not possible to express the method of the invention in such terms. Therefore, Applicants have entered claims 9-12 for prosecution in this reissue application.

Claims 9-12 On The Merits

Claims 9-12 are directed to a cyclic process for purifying an aqueous alkanolamine solution containing heat stable salt anion, including thiocyanate. In accordance with the method of the invention, the solution is contacted with Type II strong base anion exchange resin to transfer at least some of the heat stable salt anion to the resin. Both the fraction of heat stable salt anion removed from the solution and the fraction of the resin loaded with heat stable sale anion depend upon many factors determined by the user. However, the fraction of heat stable salt anion removed from the alkanolamine solution and the fraction of the resin used to adsorb heat stable salt anion are of no import in the method of the invention. Rather, in accordance with the method of the invention, substantially all of the heat stable salt anion transferred from the

solution to the resin is removed from the resin by contacting the resin with alkali metal hydroxide.

Claims 9-12 stand rejected as anticipated by or obvious in view of Keller, U.S. Pat. No. 5,045,291. Applicants respectfully traverse this rejection. Keller '291 neither discloses nor suggests the claimed invention. Most simply put, Keller '291 does not disclose or suggest substantially complete removal of heat stable salt anion including thiocyanate from Type II strong base anion exchange resin. Indeed, the prior art teaches away from the Examiner's suggestion that it would have been obvious to simply continue regeneration for a longer period to achieve substantially complete removal.

Keller '291 is directed to a method for removing heat stable salt anions from alkanolamine solution treated with alkali metal hydroxide. The alkali metal hydroxide reacts with the alkanolamine contaminated with heat stable salt anions, releasing the alkanolamine and forming the sodium salts of the heat stable salt anions. Thus-treated solution then is introduced to strong base anion exchange resin, where the heat stable salt anions are exchanged for hydroxide on the resin. The solution then is introduced to acidic cation exchange resin to remove the sodium cations, after which the solution is returned to the gas treatment system.

Keller '291 further discloses regeneration of the strong base anion exchange resin with alkali metal hydroxide ("until the heat stable salt anion in the anion exchanger have been replaced with OH ions." Column 4, lines 29-31) and of the cation exchange resin with hydrochloric acid. Keller '291 incidentally discloses one Type II resin at column 5, lines 27-28, and exemplifies regeneration only with Type I resin. Regeneration of a Type II resin is not exemplified or specifically disclosed. Thus, Applicants respectfully submit that the claims are allowable in view of Keller '291, which neither discloses nor suggests the claimed invention.

Keller '291 makes only passing reference to Type II resin, and does not exemplify use of Type II resin. However, the method of the invention is directed only to Type II resin. In particular, comparison of the types of resin suitable for use in the disclosure of Keller '291 at column 5, lines 10-33, with the disclosure of column 5, lines 30-40 of the instant application reveals an important difference. Whereas Keller '291 discloses use of strong base anion exchange resin, and lists a number of Type I resins and a sole Type II resin, the present application is limited to a Type II resin. The presence of quaternary ammonium groups on a strong base anion resin is not sufficient to identify a resin as Type II, as both Type I and Type II resins can comprise quaternary ammonium groups. Indeed, both Mobay M 500 and Rohm & Haas Amberlyst A-26 had quaternary ammonium groups attached thereto, but are Type I resins. Similarly, not all DOWEX resins having a quaternary ammonium groups attached thereto are Type II resins. Therefore, Keller '291 cannot be said to suggest or disclose the claimed invention.

Keller '291 did not realize that the strong base anion exchange resin used in accordance with his invention was experiencing an irretrievable loss of activity, probably because the rate of activity loss was low in view of the low thiocyanate concentration in the alkanolamine solution. However, Type I resin simply cannot be regenerated effectively with sodium hydroxide alone; Example 3 of this application illustrates this fact. In Example 3, a Type I resin was repeatedly exhausted with thiocyanate and regenerated with 28 pounds sodium hydroxide per cubic foot of resin. The regeneration conditions were equal to or more favorable than (using more sodium hydroxide) than the regeneration conditions in Examples 1, 2, 4, and 5 directed to Type II resin. However, Type I resin exhibited only 17 percent of virgin capacity after 5 cycles.

Keller '291 does not suggest that a Type I or a Type II resin can be successfully, repetitively regenerated or that Type II can be thus regenerated while Type I cannot. Indeed, Keller '291 does not recognize a difference between Type I and Type II, and neither use nor regeneration of Type II is exemplified. Keller '291 teaches nothing on these points. Indeed, the Examiner admits that Keller '291 does not disclose substantially complete removal of heat stable salt anion. Rather, as asserted in the Office Action, "Even if the removal step of Keller does not necessarily remove all of the minimal amount of anions transferred to the resin, it would have been obvious to continue contacting the resin with sufficient NaOH so that substantially all of the minimal amount of anions transferred to the resin are removed." However, this assertion is not well founded in view of information in the application and the teachings of the prior art.

Examples 2 and 4 of the application illustrate that continuing to contact the resin with sodium hydroxide does not increase removal of thiocyanate from the resin. These examples illustrate that, on the same resin under identical exhaustion conditions, there is no difference in regeneration effectiveness between regeneration with 12 pounds of sodium hydroxide per cubic foot of resin (Example 4) and 28 pounds sodium hydroxide per cubic foot (Example 2). Thus, the data in the specification show that continuing regeneration does not increase effectiveness of regeneration.

The prior art also teaches away from the unfounded allegation that longer regeneration would remove more thiocyanate. In particular, Taylor, U.S. Pat. No. 2,797,188, discloses that substantially complete removal of thiocyanate from Type II resin (column 5, lines 28-60) is not possible with sodium hydroxide. As taught by Taylor '188, regeneration of Type II resin with sodium hydroxide provided only partial removal of thiocyanate, so it is necessary to use sodium sulfate (or another sulfate or a selected phosphate) to substantially completely remove

thiocyanate from the resin. Therefore, the assertion that continuing contact with sodium hydroxide to remove additional heat stable salt anion including thiocyanate would have been obvious is unfounded. Prior art teaches away from such an approach.

Conclusion

Applicants now have satisfied all formalities by submission of the statement of ownership and agreement to surrender the patent upon allowance of this application. As set forth herein, claims 1-8 are allowed, and claims 9-12 are in condition for allowance. Claims 9-12 are not based on new matter, as the two points raised by the Examiner are found in the specification. Thus, the rejection based on 35 U.S.C. § 112, paragraph one, is not well-founded, as the invention is described in the specification. Further, claims 9-12 do not improperly recapture subject matter deliberately cancelled during prosecution, and, even if recapture is found, the doctrine is abrogated because claims 9-12 are materially narrower than claims 1-8. Claims 9-12 do not encompass at least the first transfer/regeneration cycle, as, in this cycle, the quantity of

heat stable salt anions transferred is not substantially completely removed by the subsequent regeneration. Also, claims 9-12 are neither disclosed nor suggested by the prior art of record. Therefore, Applicants respectfully submit that the application is in condition for allowance and earnestly solicit favorable action thereon.

Respectfully submitted,

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